Prototype Winter Storm Severity Index (WSSI)
Product Description Document (PDD)
January, 2017

Part I - Mission Connection

a. Product Description – The prototype WSSI is achieved through the use of Geographic Information Systems (GIS) by screening the official National Weather Service (NWS) gridded forecasts from the National Digital Forecast Database (NDFD) for winter weather elements and combining those data with non-meteorological or static information datasets (e.g., climatology, land-use, urban areas) to create a graphical depiction of anticipated overall impacts to society due to winter weather. The underlying structure of the prototype WSSI allows it to potentially use other meteorological datasets as inputs (e.g., deterministic or ensemble model output) to create additional guidance products that cover periods beyond that covered by the NDFD. The prototype WSSI provides a classification of the overall expected severity of winter weather using the following terminology: "limited", "minor", "moderate", "major" and "extreme".

b. Purpose – The prototype WSSI has been developed to have a two-fold focus. The first is for use as a tool to assist NWS operational forecasters in maintaining situational awareness of the possible significance of weather-related impacts based upon the current official forecasts. The second is to enhance communication to external partners, media and general public of the expected severity (potential societal impacts) and its spatial distribution due to a variety of winter weather hazards.

c. Audience – The prototype is intended for use by Weather Forecast Office (WFO) and Weather Prediction Center (WPC) staff as an enhancement to decision support services and is under evaluation for further development and validation. A small number of NWS core partners will participate in a structured evaluation. During the prototype period, a limited number of WFOs will provide public access to sub-regional views of the prototype.

d. Presentation Format – The prototype graphics are available at 15 specified WFO websites. The page depicts local views of the prototype WSSI which includes disclaimers appropriate for prototype products under NWS policy. This web page is updated at least four times a day. Currently, the output is available only as static images in portable network graphics (.png) format and a user controlled overlay on an ESRI map. See the "Examples" section. Participating WFOs will include links to the prototype WSSI on their local web pages. The participating offices and websites are listed below:

Albany, NY: http://www.weather.gov/btv/winterseverity?id=ALY
Albuquerque, NM: http://www.weather.gov/btv/winterseverity?id=ABQ

Amarillo, TX: http://www.weather.gov/btv/winterseverity?id=AMA
Binghamton, NY: http://www.weather.gov/btv/winterseverity?id=BGM
Burlington, VT: http://www.weather.gov/btv/winterseverity?id=BTV
Dodge City, KS: http://www.weather.gov/btv/winterseverity?id=DDC
Elko, NV: http://www.weather.gov/btv/winterseverity?id=LKN
Gaylord, MI: http://www.weather.gov/btv/winterseverity?id=APX
Grand Junction, CO: http://www.weather.gov/btv/winterseverity?id=GJT
Grand Rapids, MI: http://www.weather.gov/btv/winterseverity?id=GRR
Medford, OR: http://www.weather.gov/btv/winterseverity?id=MFR
Omaha, NE: http://www.weather.gov/btv/winterseverity?id=OAX
Paducah, KY: http://www.weather.gov/btv/winterseverity?id=PAH
Philadelphia, PA: http://www.weather.gov/btv/winterseverity?id=PHI
Wichita, KS: http://www.weather.gov/btv/winterseverity?id=ICT

e. Feedback Method – Feedback will be gathered from representatives from federal, state and local government partners during routine customer review meetings, as well as from a web-based survey for the general public and other users: http://www.nws.noaa.gov/survey/nws-survey.php?code=WSSI.

Comments or questions regarding the prototype WSSI can be also addressed to:

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Part II – Technical Description

a. Format and Science Basis – The prototype WSSI output is via graphical image files (.png), though the core calculations are done in a GIS environment. The following datasets are used or derived as part of calculating the prototype WSSI.

Official NWS Forecast datasets from NDFD of:
● 6-hour snow accumulation
● 6-hour ice accumulation
● 6-hour precipitation accumulation (Quantitative Precipitation Forecasts)
● Wind gust (hourly time steps)
● Temperature (hourly time steps)

Additional derived forecast parameters from other official NWS NDFD fields:
- Total snowfall
- Total ice accumulation
- Maximum wind gust within each 6 hour period
- 6-hourly snowfall accumulation rate
- 6-hourly snow-liquid ratio
- Average snow-liquid ratio

Daily National Snow Analyses is obtained from the NWS National Operational Hydrologic Remote Sensing Center (NOHRSC) which includes:
- Snow depth
- Snowpack temperature
- Snow water equivalent

Non-forecast datasets include:
- Urban area designation
- Land-use designations
- National Oceanic and Atmospheric Administration (NOAA)/National Centers for Environmental Information (NCEI) gridded annual snowfall climatology

The prototype WSSI is actually a series of component algorithms, each of which use meteorological and non-meteorological data to model predicted severity of specific characteristics of winter weather. Each of the components produce a 1 to 5 output scale value that equates to the potential severity based on the winter weather hazards. The final WSSI value is the maximum value from all the sub-components. The 5 levels are given the following descriptors: Limited, Minor, Moderate, Major, and Extreme. The specific sub-components are:

- Snow Load Index
  - Indicates potential infrastructure impacts (e.g., downed trees/power lines) due to the weight of the snow. This index accounts for the land cover type. For example, more forested and urban areas will show increased severity versus the same snow conditions in grasslands.
- Snow Amount Index
  - Indicates potential impacts due to the total amount of snow or the snow accumulation rate. This index also normalizes for climatology, such that regions of the country that experience, on average, less snowfall will show a higher level of severity for the same amount of snow that is forecast across a region that experiences more snowfall on average. Designated urban areas are also weighted a little more than non-urban areas.
- Ice Accumulation
  - Indicates potential infrastructure impacts (e.g., downed trees/power lines, roads/bridges) due to combined effects and severity of ice and wind. Designated

        urban areas are also weighted a little more than non-urban areas. Please note that not all NWS offices provide ice accumulation information into the NDFD. In those areas, the ice accumulation is not calculated.

- Blowing Snow Index
  - Indicates the potential disruption due to blowing and drifting snow. This index accounts for land use type. For example, more densely forested areas will show less blowing snow than open grassland areas.
- Flash Freeze Index
  - Indicates the potential impacts of flash freezing (temperatures starting above freezing and quickly dropping below freezing) during or after precipitation events.
- Ground Blizzard
  - Indicates the potential travel-related impacts of strong winds interacting with pre-existing snow cover. This is the only sub-component that does not require snow to be forecast in order for calculations to be made. The NOHRSC snow cover data along with forecast winds are used to model the ground blizzard. Adjustments are made based upon the land cover type. For example, heavily forested areas will have a lower ground blizzard severity than the same conditions occurring across open areas.

These raw and calculated forecast values are then used for a series of additional calculations to compute individual WSSI components which are then categorized internally on a 1 to 5 scale. The final WSSI value is the maximum from among all components for each grid point at the native 2.5 km NDFD resolution.

b. Availability -- The prototype WSSI products will be available through the end of the 2016/2017 winter season via a WFO-centric view at 15 selected WFOs. An evaluation of both internal and external comments will be conducted during the warm season for consideration in moving forward with an experimental demonstration for the 2017/2018 winter season.

Note that the map also has an option bar to select a one of the prototype WSSI components (snow amount, snow load, blowing snow, flash freeze, ice accumulation or ground blizzard) as the overlay for those users that wish to better understand what particular aspect is primarily responsible for the overall prototype WSSI depiction.

Examples:

Winter Storm Severity Index - Valid Through January 12, 2017 7:00 PM ET
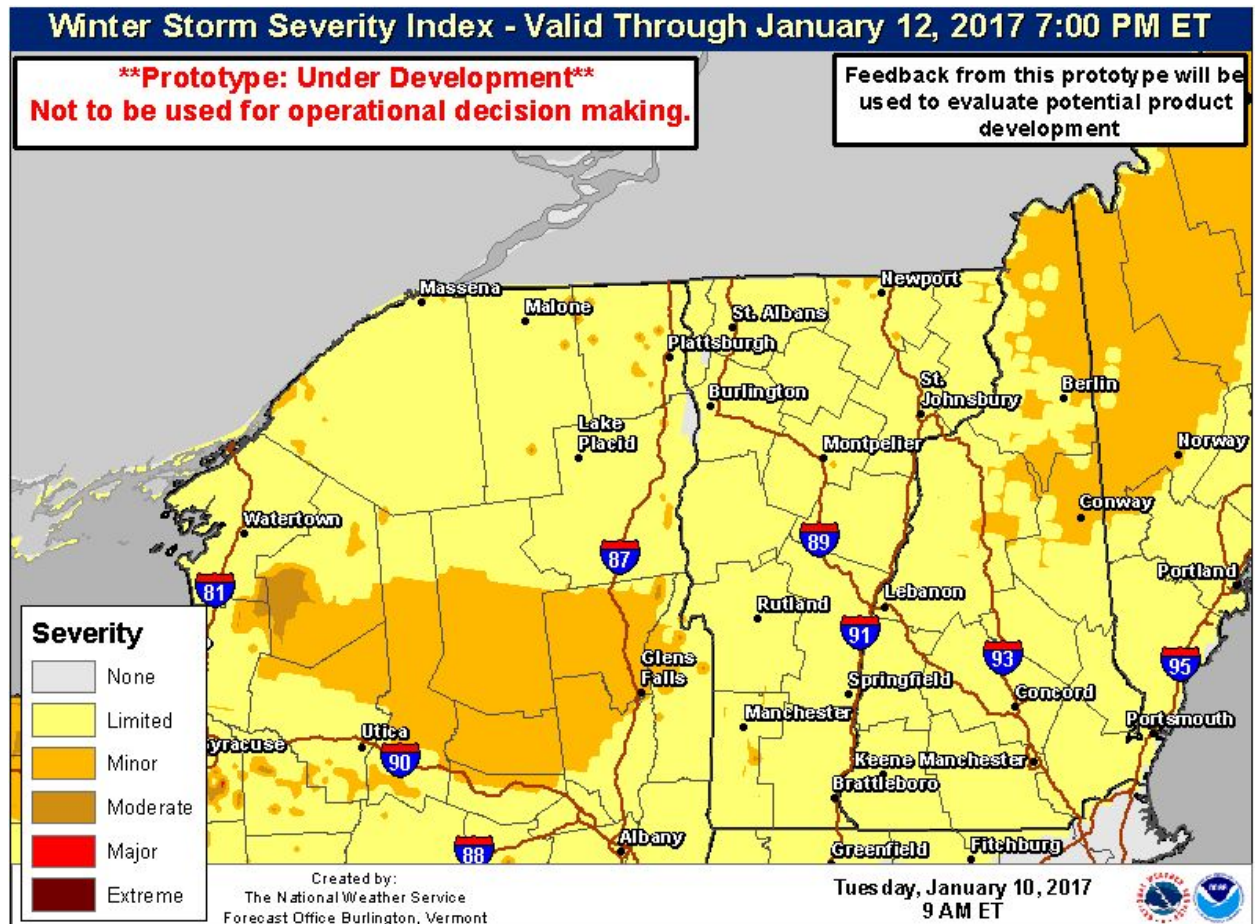
Winter Storm Severity Index - Valid Through January 12, 2017 7:00 PM ET

Prototype: Under Development
Not to be used for operational decision making.

Feedback from this prototype will be used to evaluate potential product development

Severity
None
Limited
Minor
Moderate
Major
Extreme

Created by:
The National Weather Service
Forecast Office Burlington, Vermont

Tuesday, January 10, 2017
9 AM ET